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ABSTRACT

A major legacy of the "go-go years", the late 50's and 60's when federal and foundation funding of education increased so much, was a huge increase in the number of instructional materials (both print and non-print) available to the schools. The efforts of the non-commercial curriculum development teams have been swamped by this increase and their many expensive product development and learner verification techniques have been ignored by the commercial producers who found the procedures unfeasible and too costly. The extra supply of funds for instructional materials induced publishers to throw more products on the market (where sales were certain) with no thought of instructional effectiveness. California and Florida have led the way in requiring that new instructional materials be "learner verified"; perhaps this might lead to a new style of product development that utilizes common-sense empiricism, small-scale field trials, and accumulated experience. Such evaluations are greatly needed when 99 percent of all instructional materials have not been verified by a single learner. (WH)

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Product-Quantity/Instructional-Quality Imbalance:

The Imperative of Empiricism

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The "go-go years" are over. Their positive promise has not been realized, their negative side effects persist, and their most useful residual contribution goes largely ignored by those who have the most to gain from it.

These "go-go years" -- the late 1950s through the mid-1960s -- saw the birth of programed instruction and the mobilization of a phalanx of multimillion-dollar curriculum development projects funded by Federal and foundation support. These projects, it was thought, would overpower the tradition-bound instructional materials market with exemplary, innovative products and thereby change the product development practices of the education industry. Zealous to a fault, the curriculum reformers of the "go-go years" talked about how their materials would be "school proof" and "teacher proof" even as they were spending millions of dollars to train teachers to use the materials properly. The tacit strategy of those years was to use curriculum materials as a lever for changing the "what" and the "how" of teaching and learning in elementary and secondary schools across the country. The strategy did not work as well as planned.

Now, at the end of an era, we ask why its positive promise is largely unrealized. And why its negative side effects persist. And why its most useful residual contribution is ignored. Let's consider these questions one at a time.

Simply put, a large part of the positive promise of the "go-go years" was to improve the instructional effectiveness of the educational products used by teachers and learners. But for the commercial publisher, who supplies most of these products, to follow the developmental procedures of the innovative projects would involve a level of financing that would be unbearable. In particular, the innovators field-tested their materials on a scale that only the largest and wealthiest commercial producers could handle.

And so, almost 20 years and quite a few millions of tax dollars later, instructional materials producers continue to develop materials in much the same way as they have always developed materials. And so, the promise is unrealized: Instructional effectiveness is still not the major factor in the development of the materials used to teach the country's 50,000,000 school-aged children.

Our second question -- about the continuing negative side effects -- brings up a disturbing irony. The very same Federal legislators and policy-makers -- those who legislated for and administered the funding of curriculum projects designed to produce highly effective instructional materials as models for the burgeoning education industry -- were at the same time also passing laws (lobbied for by educational producers and the educational establishment) which gave schools the money to buy indiscriminately any educational products, including those developed without instructional effectiveness as their major consideration. As Federal monies became available to schools for instructional materials, the industry responded by developing even more instructional materials. So, the effort to encourage the development of <u>better</u> materials was overwhelmed by a simultaneous effort to encourage the development of <u>more</u>, <u>then still more</u>, materials. It is this unfettered proliferation of <u>more rather than better</u> instructional materials that is the continuing negative side effect of the "go-go years."

Before moving on to our third question, however, it is important to understand more fully about the increasing magnitude of the instructional materials that began to build during those "go-go years," and still continues its rampant growth. This is not simple to do, which may explain why developers, sellers, selectors, and users of instructional materials have tended to avoid even trying to create a comprehensive picture of what's on the market. Separate efforts

have focused on film media, some on textbooks, others on television or multimedia systems, etc. But, it has only been during the last decade that attempts have been made even to catalog systematically all instructional materials in all media.

These decade-old efforts at cataloging are best realized in R.R. Bowker's El-Hi Textbooks in Print (for the print media, although listings are also given for nonprint materials which are directly correlated with textbooks) and in the catalogs of the National Information Center for Educational Media (NICEM) at the University of Southern California (for the nonprint media). If one takes the 1974 edition of El-Hi Textbooks in Print together with the dozens of separate media catalogs of NICEM and NICEM's monthly "updates" published in 1974, it is possible to make a reasonably good start at defining at least the quantitative dimensions of the instructional materials now available for school use.

The numbers by themselves are instructive, but of equal interest is the overall multimedia profile that can be created by arranging the various media in quantitative order (as shown in FIGURE 1). This total of more than 300,000

FIGURE 1: Commercially Available Instructional Materials in 1974

80,381	16mm films
54,632	35mm filmstrips (sound and silent)
44,762	overhead projection transparencies
23,590	audio tapes and cassettes
21,508	35mm slide sets
19,532	8mm filmloops and cartridges
18,500	textbooks (including workbooks and programed books)
17,500	records (estimated)
11,790	videotapes and videocassettes
6,000	multimedia kits (estimated)
2,000	games and simulations (estimated)
300,195	

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materials is, I think, a figure that merits being turned over in one's mind before it can be fully comprehended and appreciated.

One way to appreciate fully what this figure means is to compare it to a quantitative profile of the same materials available in the early 1950s prior to the "go-go years."

If we go back to the early 1950s, the years during which El-Hi Textbooks in Print began to appear as a separately bound catalog*, we get the estimated profile that appears in FIGURE 2. This estimated increase to more than 300,000

FIGURE 2: Commercially Available Instructional Materials in Early 1950s

(estimated ranges)

9,000 -	12,000 16mm films
4,000 -	6,000 filmstrips
5,000 -	6,000 textbooks
1,000 -	2,000 records
19,000 -	26,000 Total range

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materials from 19,000 to 26,000 materials gives a reasonably accurate picture of how the instructional materials market has changed during the last 20 years. Moreover, it clearly illustrates the trend of "more, then still more" materials that began during the 1950s, continued through the 1960s, and today shows no sign of abating. These last 20 years have seen the number of textbooks available to schools increased by 200 per cent, the number of 16mm films by 600 per cent, records by 700 per cent, and filmstrips by 800 per cent. But, as startling as these increases are among such long-established instructional media, there also has been an enormous proliferation of totally new media within the

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* One indicator of how much smaller the instructional materials market was is the fact that prior to the 1950s, El-Hi Textbooks in Print appeared as a once-a-year appendix to a single issue of the magazine, Publishers Weekly, the industry's major trade publication.

instructional marketplace. As FIGURE 2 indicates, the impact of audio tapes and cassettes, videotapes and -cassettes, overhead projection transparencies, multimedia kits, 8mm filmloops, and games and simulations had not yet hit the school market in the early 1950s.

Today, in addition to the more than 300,000 separate instructional products available to schools, there are increasing numbers of larger, composite entities known as instructional "systems," which can in many different ways incorporate many media. However, each such system is itself a product. At times, these systems -- in contrast with commercially available instructional materials -- may use locally generated ("home-made" or "found") materials, perhaps built around an instructional staple like a standard textbook, or locally developed curriculum guides that usually do not become known beyond the school or district. However, it may be worth noting that recently a few commercial enterprises have sprung up designed to seek out and distribute such "home-grown" products and systems on the commercial instructional materials market. At present, such systems number in the hundreds, rather than the thousands.

But one, as yet unmentioned, type of instructional material used by many schools that does indeed number in the thousands is the so-called "freebie"-- materials that are available to schools without charge, often on a loan basis, from hundreds of business and industrial corporations. If we add these "freebies" (one service lists more than 20,000 in their guides) to the more than 300,000 commercially purchasable materials now on the market, we can reasonably estimate that the average state or local education agency covering the normal K-12 grade span has access to somewhere in the neighborhood of 400,000 separate instructional materials. And more are on the way each year.

This means that were we able to calculate it with precision, the percentage growth in the number of product options available in the total instructional materials market from the mid-1950s to the mid-1970s might be as high as 2,000 per cent. But let us be conservative and consider only those commercially available materials that were in fact cataloged in the early 1950s (FIGURE 2) and those similarly cataloged today (FIGURE 1). We would still come up with a growth factor of 1,500 per cent!

During the last two decades, then, in an economy that has outstripped the rest of the world in providing its consumers with options well beyond anything heretofore dreamed of, the instructional materials market has probably -- and almost without notice -- outstripped all other markets within that virulent economy in the increase of product options.

By comparison, for instance, such a key industry as automobile manufacturing has not increased its product options by 1,500 per cent during the last 25 years (even if one includes all foreign models). In fact, one would be hard put to find any American industry of any sort which has experienced comparable product option growth during the same period or, indeed, during any comparable period of years.

This quantitative phenomenon deserves a good deal of careful analysis, if only because such unprecedented and rapid quantitative growth provided an almost inevitable guarantee that high quality, carefully developed, instructionally effective materials would be quantitatively overwhelmed by rapidly produced, less effective product options. This tended to be particularly true for the newer media, which have often sold just because they were newer, rather than because they were better.

In such a climate, it is highly unlikely that commercial producers will spend the time and make the effort necessary to learn how to improve the instructional effectiveness of their products. After all, a commercial producer, unlike the Federal- or foundation-funded developer, is thinking about beating the competition to the market in order to recover and turn a profit on a $10,000 investment in a filmstrip, or a $50,000 investment in a film, or a $200,000 investment in a major new textbook.

At this point, we're about ready to consider the final question: the important residual contribution from the "go-go years." During the late 1950s and early 1960s, while no one apparently was looking, some of the innovators began to use product development techniques that can be readily and relatively inexpensively applied to the instructional improvement of all materials. These techniques constitute the useful residual contribution of the "go-go years." Not based on hard science, they amount to an accumulation of hard-won empirical procedures arrived at largely through the creative application of intelligent trial and error -- reinforced by success.

Devoid of the scientistic pretentiousness that characterized so many of the overstated and oversold "instructional technologies" of the "go-go" innovators, which promised to improve all of education, this residual base of empiricism promises only to help improve the instructional effectiveness of individual instructional materials.

This reliance on an empirical rather than a traditional or theoretical approach to product development and improvement evolved slowly but almost simultaneously out of the work of data-oriented curriculum materials developers, instructional programers, and instructional systems analysts. Some of those responsible for the evolution of the techniques that characterize this instruc-

tional empiricism came originally from research on learning, some from the practice of teaching, others from industrial and military training, and a few from educational publishing. Although the value of this empiricism has yet to be broadly demonstrated with instructional materials, I submit that its value would become quite apparent if the techniques it has generated were applied to significant quantities of the instructional materials currently being used by teachers and learners.

The present reality is, however, that only a very few of the more than 300,000 materials that find their way into the hands of the nation's 50,000,000 school-aged learners have been empirically developed and continually shaped for -- and by -- use with those learners. This reality exists, in part, because of the slowness with which the educational materials industry introduces changes into the way it goes about developing materials. This reality also exists because 50,000,000 learners attend schools which fail to seek out, to demand, and to select such empirically shaped materials.

But first, let us make clear what is meant by a product which can be characterized as having been empirically developed or revised with instructional effectiveness as a foremost consideration. The essential attributes of any such product would not necessarily be apparent within the product itself, but rather would pertain to how the product has been developed or revised. For instance, has the product developer systematically gathered detailed fine-grained data? Has the developer analyzed those data in order to discover not only what <u>specifically</u> learners have learned from the materials, but also what <u>specifically</u> they were supposed to but did not learn? And finally, has the developer used the results of his fine-grained data-gathering and his detailed analyses to improve the product's effectiveness by changing

or manipulating relevant internal, or textual, variables? Often, such internal changes may mean little more than correcting a misleading direction or replacing a confusing example or illustration with a clearer one. In other cases, more radical surgery may be in order.

As a further defining attribute, we should expect to find the producer systematically gathering and analyzing data about how the product is actually used once it gets into the hands of teachers and learners. The outcome of investigations of these external, or contextual, variables that are affecting the product's use would most often lead to changes in teacher's editions or manuals, directions to students, or changes in (or the initiation of) inservice teacher training programs.

Given this much of a definition, it is possible, I think, to use it to arrive at an estimate of what portion of the more than 300,000 currently available commercial instructional materials can be said to have been empirically developed with a demonstrable concern for instructional effectiveness held clearly in mind.

Such an estimate was first presented to a Congressional Subcommittee in 1971*. That 1971 estimate was based on a systematic sampling of products in the 11 media categories listed in FIGURE 1. However, the total number of products categorized and hence available for sampling was at that time somewhere over 200,000. It was estimated that, of those 200,000-plus materials then

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* The complete text of the "Statement of P. Kenneth Komoski" and the ensuing dialog with Congressman Brademas are printed in Hearings before the Select Subcommittee of Education of the Committee on Education and Labor, House of Representatives, Ninety-Second Congress, held to establish a National Institute of Education.

available to schools, only about 2,000 could have fulfilled one or more conditions of such a definition. As FIGURE 1 illustrates, the number of materials categorized -- and hence available for analysis -- in 1974 is in excess of 300,000. This increase of some 100,000 products is not due entirely, or even in large part, to the appearance of new products in the instructional materials market. A good portion of the increase is the result of more comprehensive cataloging efforts during the last four years. Thus, many thousands of the materials now accessible to schools according to catalogs are not, in fact, totally new to the market, but simply more accessible to purchasers. But if, then, we assume that the production figures for new materials by the education industry has been more or less consistent during the last decade, we may also assume with some confidence that the proportionate number of 100,000 additional products that might meet our definition would remain essentially the same. On that basis, we may update to 3,000 the 1971 estimate of 2,000 products whose development and/or revision had demonstrated one or more of the attributes of empirically developed and improved materials. Or an overall percentage of approximately 1 per cent (i.e., 3,000 out of a total of 300,000)!

These numbers would seem to make devastatingly clear that the two-pronged strategy of the "go-go years" -- that is, the Federal and foundation funding of exemplary products on the one hand, and of broad-scale purchasing of readily available products on the other -- has had little impact on the instructional quality of the majority of products that find their way into the hands of teachers and learners. The sheer quantity of materials in everyday use for which instructional effectiveness has never been a primary concern has easily overwhelmed the impact of the relatively few potentially more effective instructional materials that have entered the market.

Given the reality of these numbers, the prognosis is not bright for reversing this 20-year trend. Nevertheless, there is some evidence that the education industry is making an effort, if not to move in that direction, at least to consider such a direction. In 1973, the Association of American Publishers (the industry's major trade association) conducted a precedent-setting survey designed to discover the extent to which its member companies were engaging in product development of the type characterized by at least one attribute of the definition offered above. It was claimed by the responding publishers that more than 50 per cent of the programs completed during the two years prior to the survey had been "field tested in some way."

Although the report went on to state that such testing often "occurs after the programs are published," this after-the-fact bow to empiricism should nevertheless be applauded by anyone concerned with improved instructional product development. However, the reality of numbers still makes it highly unlikely that the present materials-quantity/instructional-quality imbalance in the instructional materials market will be redressed in the near future. For example, the average number of new textbooks appearing in yearly editions of El-Hi Textbooks in Print during the last five years has been about 1,000. But even if we assume that every one of a projected 5,000 to be produced during the next five years is going to be produced by only those companies which responded to the AAP survey, this would mean that approximately half of these new textbooks (i.e., 2,500) might be counted among the potential "redressers" of the present quantity/quality imbalance.

As important as it is for these companies to do this (and one fervently hopes that they do), the net impact -- 2,500 products against what in five years, according to NICEM's extrapolations, may approach a half-million materials--

will hardly be felt unless some other changes come about as well.

One of these changes, of course, is for more producers to commit themselves to building each of their materials upon a firm base of empirical data -- systematically gathered from users -- and to using these data to improve the product's instructional effectiveness throughout its developmental and full market life. Secondly, there is a need for state and local instructional materials purchasers to establish purchasing criteria that preclude the purchase of materials that have not been empirically developed or revised (either textually or contextually) in light of data gathered from users who have actually attempted to learn with the materials in question. Two states, California and Florida, have already begun to respond to this need. Both states have recently passed laws calling for publishers, when they offer materials for adoption in these states, to supply evidence that they have engaged in "learner verification" of their products either during their development or their revision.

But these two changes would tend to affect only new or newly revised products. The reality of the instructional materials market today is that the majority of its 300,000-plus materials have never been empirically shaped by learner feedback during development; and, in addition, because most of these materials are from the nonprint side of the market -- which lacks even the tradition of regular product revision cycles -- most of these are materials that have never been put through any sort of regularly scheduled revision process whatsoever. For example, 16mm films marketed to schools are seldom, if ever, revised on the basis of empirical data, either during development or after their appearance on the instructional materials market. Of the more than 80,000 16mm films currently listed in the three-volume Index to 16mm Films.

published by NICEM, only a handful of them, fewer than 1 per cent, are identified as having been revised since their original date of issue; yet many of these films have been on the market for more than 15 years.* The reasons for this lack of developmental or postpublication revision of 16mm films are many, some of which are grounded in tradition and others in the economics of sound film production.

Nevertheless, in the industrial film field, instructional films do get developed and revised on the basis of empirical data related to instructional effectiveness. Sometimes, it's at the "storyboard stage," sometimes in the "rough cut stage," sometimes later. In other words, it can be done (although once a film is on the market, revision can, indeed, be expensive).

However, it should also be noted that many 16mm films used by schools are not truly instructional. Such films may be designed to make a single, provocative statement, or to provide the viewer a look at a "slice of life," or to present an aesthetic experience, etc., all of which may set the stage for instruction that is actually carried on by a teacher within a "contextual" instructional design which may be supplied by the producer, but is at times either purposely or unconsciously left to the teacher. Because such films have no internal design of instruction, the external instructional design, if it is explicated in an accompanying manual or other printed matter, may easily be revised to improve its instructional effectiveness based on observations of learner

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* It should be pointed out that the NICEM Index also lists 16mm films that are out of print. This is due, in part, to the fact that the NICEM data bank performs an archival function in addition to its function as a source of currently available materials. However, many of the "out-of-print" films indexed by NICEM are far from "out of use" by schools. Many of these out-of-print titles are still circulated through film libraries, and others are owned outright by schools that use them regularly.

reactions to a teacher who is following the instructional design outlined in the manual. However, if the film has no clearly apparent internal or "textual" instructional design and is not accompanied by a "contextual" design developed by the producer, it falls into a category of films that properly lies outside the kind of films that may benefit from empirical instructional revision. It may be useful to think of such 16mm films and other similar media items as being astructional in their intent and to consider them as lying outside of this discussion.

But, if we turn our attention from 16mm films to 35mm filmstrips, a medium which is almost always instructional in intent, the present situation, while in some ways no better than that for 16mm films, does hold some hope of future movement in the direction of correcting the present overwhelming materials-quantity/instructional-quality imbalance.

At the present time, there are almost 55,000 silent and sound 35mm filmstrips on the market, as indexed by NICEM. Unlike many 16mm films, however, a sound filmstrip seldom stands alone. Usually, it is part of a series of filmstrips, and invariably the series is accompanied by printed materials for use by the teacher (usually a transcript of the audio, accompanied by discussion questions and some suggestions for using the series). On the average, there are about four to five filmstrips in a series. This means that the 55,000 filmstrips currently available to schools are actually more like 11,000 discrete instructional entities. Each entity has examinable and analyzable instructional sequences, which -- unlike the fast-running, "all of a piece" sequences of 16mm films -- can be textually manipulated and revised with relative ease, and relatively little expense, at any stage of development of mar-

Yet, an extensive sampling made of these materials indicated that some 20 per cent of those sampled are more than 15 years old, and that only a miniscule number have ever been revised in any way during the entire course of their rather lengthy market life. But of all the instructional media now available to schools, filmstrips -- whether silent or sound -- are by far the most amenable to revision both textually and contextually.

First of all, compared to motion pictures and to textbooks and other printed materials, filmstrips are relatively inexpensive to produce and singularly less expensive to revise at any phase of development; and this includes postpublication revision. This is true because each element of a filmstrip (either a separate slide or piece of artwork, or a discrete segment of audio tape) is relatively easily manipulated and edited, either in relation to other elements or within itself.

Furthermore, production economics favor filmstrips over textbooks. Textbooks require large print runs to reduce their per-unit cost and are dependent on large initial investments and large volume sales, leading to relatively small -- often less than 10 per cent -- per-unit profits. Conversely, printing costs per filmstrip do not drop as the size of a run increases. And a large volume sale of a filmstrip series begins at only 2,000 sets a year, but can return a profit ranging from 200 per cent to 400 per cent and higher per unit sold.

Without the textbook publisher's large product inventory to hold him back, and with his initial investment returned in relatively short order, the filmstrip producer is in a much better position to make changes aimed at improving the instructional effectiveness of his product at almost any time. This can be done by analyzing relevant empirical findings and then by changing just those

slides or pieces of artwork or those portions of the audio that require changing. And, if the change required seems to stem from a context-of-use, rather than from a textual, problem, the producer may need to make changes only in the printed material used by the teacher. In either case, the investment in time, money, and editorial effort is not great at all. Yet, the reality is that most filmstrips are not empirically developed and improved on the basis of data gathered systematically from learners.

A similar set of economic and editorial conditions holds just as true for the burgeoning field of instructional audio cassettes, overhead projection transparency sets, sound-slide series -- even videotapes and -cassettes -- as it does for filmstrips. Thus, on the surface at least, the flexibility of these newer media would seem to bode well for the broad acceptance of product improvement through empiricism, but the present reality is that this flexibility is not being effectively exploited to that end.

Another factor that makes these newer, more flexible media pivotally important for the future development of the instructional materials market is the fact that they represent the growing edge of that market. The sound filmstrip, for instance, has demonstrated a sales growth during the last few years that no one could have predicted a decade ago. In 1973, for example, sales put the filmstrip field ahead of 16mm sound motion pictures for the first time in history. The filmstrip producers from among the 70 companies that comprise the Educational Media Producers Council posted $70,000,000 in sales for the year. The prognosis for the next few years is even more optimistic. Sales of audio tapes and cassettes long ago passed the all but stabilized sales of instructional audio record But an even more dramatic indicator of the growth of this sector of the instructional materials market is the increase during the last three years in the

of producers and distributors actively involved in it. As can be seen in FIGURE 3, the growth of producers and distributors in the audio tape and cassette market from 1971 to 1974 is 20 per cent.

It is interesting to reflect on the extent to which growth in the audio cassette market may be related to the growth (better than 30 per cent) shown among producers/distributors of multimedia kits which make heavy use of audio cassettes. This increase in producers/distributors of multimedia materials may also be responsible in part for the considerable increase in the areas of study prints and charts, both common components of multimedia packages. We can further speculate that the smaller increase in the number of producers/distributors of filmstrips (10 per cent) during the same period may be somehow linked to the fact that filmstrip producers had already entered the multimedia sector of the market prior to 1971. But this is merely speculation that may, it is hoped, prompt a more thorough analysis of the relatedness of these complementary multimedia sectors of the market.

Two other, more competitive than complementary market sectors referred to in FIGURE 3 demonstrate interesting comparative growth patterns. These are the motion picture film field (16mm, 8mm, and kinescopes) and the videotape and -cassette field. The robust 30 per cent increase in producers/distributors of the video medium as compared to the modest 2 per cent increase in the 16mm film sector, and the absence of growth shown in the 8mm film and kinescope sectors, make this competitive segment of the market also worthy of a future analysis.

In comparison to the flexible, dynamically changing side of the instructional materials market represented by these newer nonprint media, the textbook side of the market seems, at least relatively, to be a model of stability. The

number of companies involved in the production and distribution of textbooks has, indeed, remained quite stable over the last decade and sales figures have risen only slightly during the last three years -- topping $500,000,000 in 1973 for the first time in history -- but these record-breaking sales are more a reflection of inflationary rises in costs than of significant growth within the industry. However, what is perhaps more noteworthy is the fact that, while they have been buying a relatively stable number of textbooks for some years now, schools have been steadily increasing the amount of their modest instructional materials budgets spent on nonprint media. Thus, in 1973, while elementary and secondary schools spent $548,000,000 on textbooks, they spent $423,000,000 on other instructional materials.

The really significant difference, however, between these two expenditure figures lies in the difficult-to-discern area of comparative per-unit profit margin for textbooks and nonbook media. As already noted, the textbook is a high-volume, low per-unit profit commodity. Textbooks have sold increasingly well during their almost 200-year history in this country. One major reason for the continuously increasing sales of textbooks over the last two centuries has been this country's continuously growing school age population. But this factor -- which has not only continued throughout this century, but which increased sharply after World War II and through the "go-go years" -- has now stopped. And, we are told, it will probably move slightly in reverse for the remainder of the century. Exactly what effect this will have on the textbook segment of the instructional materials market is difficult to say, but it is hard to imagine that this change in what has amounted to built-in, seemingly guaranteed annual sales increases is not going to force a number of other changes directly relevant to the interrelated issues of quantity, quality, and the empirical improvement of instructional materials.

FIGURE 3: Media (Nonbook) Producers/Distributors*

	1971	1974 (percentage chang
audio tapes and cassettes	283	350 (+24%)
charts	56	80 (+43%)
computer-asssited instruction	4	10 (+150%)
dioramas	13	17 (+38%)
8mm film loops and cartridges	240	250 (+ 4%)
8mm films	180	190 (+ 5½%)
16mm films	710	726 (+ 2%)
35mm - 70mm films	61	72 (+18%)
filmstrips	498	548 (+10%)
globes and maps	80	84 (+ 5%)
kinescopes	38	40 (+ 5%)
microfilms	15	18 (+20%)
models	56	52 (- 7%)
multimedia kits	196	268 (+37%)
overhead projection transparencies	212	210 (- 1%)
records	260	260 (0%)
videotapes and - cassettes	112	145 (+30%)
realia	25	30 (+20%)
slides	290	250 (-14%)
study prints	92	120 (+30%)
teaching machine programs	69	66 (- 4½%)

* sources of data: Audiovisual Market Place, editions covering the years 1971 - 1974

One of these changes may well be the appearance of more tightly targeted print media surrounded by co-related nonprint media worked into mini-systems aimed at individualizing and personalizing instruction. The production runs for such new print materials would be much smaller than traditional textbook runs (and more like nonbook media production runs) because such text materials -- unlike traditional textbooks -- would not be marketed as though they were appropriate for use by all students in a given grade. The enabling technology for such small-run printing is available right now (available, in fact, in three new competitive printing/binding systems).

Given the possible emergence of such tightly targeted, small-run print materials within a smaller, increasingly competitive market forced to respond to continually rising educational expectations, there may well be a growing attention paid to improving the instructional effectiveness of such materials. The unprecedented 1973 publisher-conducted survey on the prepublication testing of textbooks may well be the harbinger of movement in this direction. However, that particular survey seems to have been motivated more by a need to react to the recently passed learner verification legislation in California and Florida by scientifically proving the quality of those products about to enter the market by a sort of ex-post-facto empiricism, than by a commitment to empirically improving the quality of these products through regular pre- and postpublication verification and revision.

Nevertheless, textbook publishers followed this survey with a trade association statement issued in early 1974, in which they agree to the importance of such prepublication and postpublication verification and revision. The statement, while too much in the vein of a self-serving apologia, does give evidence of movement in an important area within an industry that is not known for rapid

change. More importantly, this statement by the Association of American Publishers does put members of the textbook industry on record as to their intentions in this regard, and the AAP-sponsored survey does provide baseline data against which to measure the future fulfillment of this stated intent. Furthermore, whether those who favor nonprint media like it or not, textbook publishing, despite its depressing economics, is -- and is likely to remain for some years yet -- the mainstay of the education industry. And the textbook is likely to remain for some time to come the nuclear medium around which newer instructional media will cluster. Finally, if textbook publishers are serious about delivering upon their stated intent to verify empirically and to revise their products accordingly, and -- what is even more critical -- if they understand what this implies in terms of practical operations having to do with fine-grained data-gathering, hard-nosed analysis, and the conscientious application of findings to instructional improvement of every (textual and contextual) aspect of a material, then, there may indeed be hope for redressing the current materials-quantity/instructional-quality imbalance.

I say this because of the still pivotal role textbooks play in today's curriculum, and because, rather ironically, they are the <u>least</u> numerous of the major instructional media. The potential impact of, say, 2,500 new, empirically verified and improved textbooks on a market filled with more than 300,000 materials, most of which are not of this sort, may seem small indeed. But if 2,500 such materials were to appear in the next five years, as we earlier speculated they could, they would account for as many as one out of every 12 textbooks on the market.

That ratio could become a critical one if it were to be mirrored on the other of the more than 300,000 instructional media as well, for it would mean

almost 30,000 nonprint materials of a new, improved -- and continually improvable -- sort. Those 2,500 textbooks and 30,000 nonprint materials might just prove to be enough product options from which discriminating school selectors might find what they need to improve classroom instruction, at least to begin with. And, in time, the current quantity/quality imbalance might even disappear. What are the chances?

At the present time, the chances do not look good. Evidently, legislators in both California and Florida agreed with this prognosis when they decided to pass laws requiring that producers engage in the empirical-based practices of learner verification and revision for all materials offered for adoption in those states. But now that these laws have been passed in California and Florida (and numerous other states seem to be ready to follow suit), a critical question remains. This question is not, as some think, whether the states will demand rigorous compliance to the letter of such laws. Rather, it is the question of how producers and users of instructional materials will go about meeting their responsibilities under these laws. Implicit in this question is also the question of whether very many producers have a clear understanding of what is expected of them under these laws, and of how well they are able to translate these expectations into operational activities designed to change effectively the way they have traditionally developed their products. At the present time it is quite apparent that not very many publishers have a clear understanding of what is expected of them, and consequently, even fewer are taking steps to rethink and adjust their product development procedures to the new emphasis on instructional effectiveness and the attention to empiricism required by this emphasis.

To an extent this is to be expected, given the fact that laws mandating

the empirical learner verification of materials are not yet backed up with specific regulations as to what producers must do in order to comply with the laws. This has been compounded somewhat because the California State Department of Education's initial interpretation of that state's learner verification law has tended toward reducing the intent of the law to a demand that producers prove that their materials have worked well with learners. And then reducing that demand to a point where almost any sort of "proof" is viewed as acceptable.

In some cases, this has sent producers to their files of teacher and administrator product testimonials or to the task of soliciting such self-serving testimonials. In other instances, it has prompted those producers who can afford it to engage in large scale, after-the-fact field-testing of materials involving thousands of students and hundreds of schools in scores of school districts. The resulting statistical overkill produced by such studies has then been packaged in impressive (in one case full-color) "learner verification documents," which have been offered as evidence that learners have indeed learned from the materials so tested. However, to date, the majority of such documents has been found to contain more files of testimonials than tables of mean gain scores.

But the publishers who have hurriedly prepared these documents cannot be blamed for missing the point, having been given the impression that what they must do to comply with the California law is to <u>prove that their materials instruct</u> rather than to <u>improve continually how well they instruct</u>. Nevertheless, even though the language of the California law is quite cryptic, it does state that "Learner Verification means the continuous and thorough evaluation of instructional materials for their effectiveness with pupils" (AB531, Section 9426) and does go on to point out that such evaluation is to be carried out in order

"to improve the quality and reliability of (such) materials" (AB531, Section 9234). However, to date, California has found it simpler to require scientific proof of a material's effectiveness in a statistical report of a one-time field-test than to require empirical evidence that the material has been -- and will continue to be -- improved from revision to revision.

But it can only be a matter of time before policy makers in California and the publishers serving the schools of that state realize the extent to which "scientific studies" involving large "national or statewide samples," "experimental controls," and "scientifically valid procedures" (and conducted by high-priced "independent" evaluation agencies to lend credibility) can be an enormous misdirection of monies. Such monies would be far better spent on small sample, carefully conducted, intensive empirical investigations designed to identify the specific segments, sequences, sentences, illustrations, or words that are hampering learners from learning what the material is intended to help them learn. The after-the-fact, overly large-scale study is reminiscent of the same sort of window dressing for sales purposes that comes with unnecessarily slick production formats.

In an obvious allusion to the latter syndrome, one educational company executive commented, at a meeting of educational producers during this last year, that these days the industry is standing at the "corner of Four Color Boulevard and Cosmetic Avenue." This may well be true, but I would submit that -- at least on alternate days -- it is standing at the "crossroads of Scientistic Expressway and Empircism Trail." The electronic signposts leading to the high-speed Expressway deliver computer-generated messages guaranteeing to anyone who can pay the toll an easy ride -- downhill all the way. Empiricism Trail, on the other hand, is open to everyone willing to make the effort and is within

everyone's budget -- but it is a slow, uphill climb.

There is a serious question of whether educational producers (despite their expressions of intent) and instructional materials selectors (despite their own statements about wanting "to put the best possible materials into the hands of learners") will, in fact, be willing to follow the slow uphill course of empiricism -- especially if it means any reduction in the flow of product options. Given the mutually reinforcing behavior of producers and purchasers over the last two decades, it does seem reasonable to speculate whether either party would seriously consider reducing that flow, even if there were a good chance of this resulting in better quality options.

Yet, this is the situation that might prevail, if increasing numbers of states, in effect, reduce the number of product options that may be bought with state funds by local schools by simply precluding the adoption of materials that have not been empirically learner verified and revised. It is not outside the realm of possibility that in order to avoid such reductions, educational producers and educational practitioners would jointly lobby in the 20 odd "adoption states" against any such restrictions on their freedom to select materials. After all, it was just such a publisher-educational establishment lobby that almost 20 years ago succeeded in getting Congressional legislation passed which put Federal dollars into the marketplace and thus opened the "go-go years" of option proliferation in the first place. The fact may well be that two decades of unprecedented product option growth -- even if it has been greater than that of any other industry -- may simply not be enough to satisfy producers and purchasers of instructional materials.

But let us also speculate in the other direction and suppose that state

and local selectors of materials take the imperative of empiricism seriously. And that those selectors make every effort to ascertain before selecting a product whether or not its producer has empirically improved it. And that they are willing to buy only those products that have been improved by means of the learner verification and revision process. Certainly, if materials selectors wanted to, they could take such a stand. And producers, who are notoriously responsive to selector demands (especially those with purchasing power), would have no choice but to comply appropriately by empirically improving every product they planned to keep on the market.

However, even speculating about such an unlikely development raises the important question of just how realistic it is to expect producers to initiate and sustain such a broad-scale commitment. Clearly, it would be totally unrealistic if we interpret such a market demand to mean that every product now under development or already on the market would have to be subjected to a large sample, experimentally controlled "scientific" validation study conducted at great expense by either an out-of-house educational evaluation agency or a separate division within an education company itself. Cost alone would make meeting such a demand completely impossible for all but the largest and most profitable companies. But even for them, the logistical, statistical-sampling, and manpower management problems would be horrendous.

But, on the other hand, if such a demand were based on the expectation that each product entering -- or being revised for -- the market would be regularly and carefully tried on small groups of learners who are tested, observed, and even individually interviewed in order to find out just where, why, and how a material is failing to help them learn, then, there is no question that the instructional effectiveness of every material now on the market could be

economically and efficiently verified, revised, and improved. And, what is more, there is every reason to believe that any given small-scale verification and revision of a material conducted in this fashion would be apt to throw just as much, if not more, light on the internal (i.e., textual) shortcomings of that material as any given large scale study, which is replete with a nationwide sampling of learners and a rigorously controlled experimental design. But at a small fraction of the cost.

In fact, a number of education industry "insiders" have privately voiced the opinion that the cost of such small scale investigations of a material's instructional effectiveness could easily be absorbed by any company now in the market. And it could be done without cutting into profits and without forcing companies to make room in product development and revision schedules for such activities, but not without properly sensitizing and training editors and data analysts to the nature of the job they are being asked to do. These insiders have also remarked that were the education industry to adopt such developmental procedures on a broad scale, it would greatly strengthen its case against the Internal Revenue Service's recent ruling which has questioned the validity of what the industry has been writing off as research and development expenditures.

In addition to verifying materials empirically on very small groups of learners, it also is important that from time to time the members of such editorial/materials-analysis teams personally and systematically observe how schools are actually using the materials they have developed or revised. Such verification observations are necessary in order to gather data on which to base any needed "contextual" revisions of a particular material. But, here again, as with data gathered for textual verification, most context-of-use

verification can probably be done quite effectively within a few well-selected classrooms. The reason this sort of parsimony of numbers is possible for both textual and contextual learner verification and revision activities is that, unlike one-time "scientific" validation studies, such activities are designed to gather fine-grained, detailed data that has high utility as a basis for product improvement. Thus, any size sample of learners or learning settings -- no matter how small -- that produces such data is quite acceptable. The major issue in product validation studies -- predicting how well a product will perform with the total target population of learners, based on its performance with a representative sample of such learners -- is simply a nonissue for learner verification and revision activities.

The question of just how small a sample of learners may be used for such investigations can be argued, if one wishes to do so, but the answer to this question -- as well as to many other questions related to the improvement of instructional materials -- can best be established empirically.

Therefore, when a publisher commits to the continual learner verification and revision of a product, it is likely that even one member of the target population may be a useful subject for a verification episode. This "sample" of one is entirely acceptable because it is reasonable to assume that any instructional difficulties with a given material that are experienced by one member of the larger target population are very likely to be experienced by other members of that population. Thus, the "law of parsimony" may perhaps be more elegantly applied in the learner verification and revision process than anywhere else in educational research. This should be remembered by all who are tempted to think that the publisher that carries out a program of large sample learner verification and revision activities necessarily has a better program just because he

uses large samples. He may simply be wasting money and time, and passing the cost of that waste on to the schools.

But why, then, do many companies in the education industry engage in large, "national sample" field-tests and validation studies, when such studies increase a company's costs? Why put so much money and faith in statistics? Is it because producers are committed to a policy of scientifically proving the generalizability of their findings statistically? Or has it more to do with the fact that a large national sample of school districts used in a field-test improves eventual sales statistics because it shows that "schools in your state" tried (and maybe even later purchased) these materials?

All companies haven't engaged in such a mixed use of statistics; nonetheless, even many of those companies now feel they will have to launch large sample field-testing programs to meet what they erroneously understand are the requirements of the learner verification and revision process.

One hopes that these companies have heard of the law of parsimony and use it unsparingly. This is not to suggest that all learner verification episodes ought to be conducted with just one learner. It does suggest, however, that a one-learner episode would be better than no episode at all -- which is, unfortunately, the condition that pertains to the overwhelming majority of the hundreds of thousands of materials currently being marketed to schools. And it is this condition more than any other single factor that is responsible for the present quantity/quality imbalance in the instructional materials market.

It is interesting to note that the literature on instructional materials research contains a number of studies that have looked at the effect of revising material on the basis of empirical verification with a single learner. Among

them are studies by Fleming, 1963; Robeck, 1965; and Markle, 1967. The study by Robeck, discussed by Eva Baker in AV Communication Review (Winter, 1973), compared the performance of an instructional material that had been revised on the basis of data gathered from a single sixth grader to the performance of the original (non-learner verified) version of the material and, in addition, to the performance of yet a third version of the same material based on data from a second, single-learner verification episode. The three versions were tested on three matched groups of learners. Baker summarized the results as follows: "The performance of the two revised editions was significantly better than that of the prototype (i.e., the original nonverified, nonrevised version) although the performance on the second revision was not found to be superior to the first revision."

Given this provocative finding, let us indulge in some provocative fantasizing. What if the Association of American Publishers and the Educational Media Producers Council were to join forces to sponsor a number of recognized, independent instructional materials researchers -- such as Ernst Rothkopf, Susan Markle, Eva Baker, and Richard Anderson, to name only the most obvious -- to conduct replications of this study, using a variety of instructional materials? And what if they all confirmed Robeck's findings to the effect that a single learner verification and revision "episode" produces significantly better learning than the nonverified and nonrevised original but that a second single learner verification and revision episode produces no significant increment in learning over the first verified and revised version on matched groups of learners? Then, armed with this evidence, what if the two organizations convinced each of their respective members (this would mean about 95 per cent of all textbook publishers and producers of other instructional materials) to carry out

empirical learner verification and revision of all materials currently being marketed by each company on at least one learner? (Training editors and materials analysts to carry out the work might take some time, but it really could be done in fairly short order.) Then, once such empirically based, learner verified revision had been made, what if every school in the country agreed to adopt and use these revisions immediately?

What if all of this came to pass? It is as tempting to contemplate -- as it would be difficult to measure -- the gross increase in learning that might occur with 50,000,000 school-aged learners across the country during the following school year. It well might be that the positive results of such a massive infusion of empiricism into the market would be not as much nonmeasurable as immeasurable.

And the only exceptions to the single learner verification episodes would be cases in which the single learner had absolutely no difficulty whatsoever in understanding and mastering everything the materials in question was designed to teach. In such extreme, positive cases, generalization to other learners would not be allowed and the verification and revision would be repeated with a second learner. In other words, generalization would be made only from those single learner verifications in which the learner experienced difficulty in understanding and mastering what the materials were designed to help students learn.

Then, having reaped the benefits of such widescale textual revision for each of those materials, the industry could move toward some similarly parsimonious context-of-use learner verification and revision based on equally fine-grained data gathered from at least one "classroom" each in a traditional school,

an open school, a low income school, a high income school, a suburban school, etc.

This suggestion is made with an awareness that it may be ridiculed by those in the education industry who do not wish to change their traditional methods of product development and revision and who may, therefore, purposely misinterpret the spirit in which it is made. But in the long run, such ridicule cannot dull the ability of the point that is being made to puncture the complacency and inertia that are keeping the industry from fulfilling its proper role in this society.

After all, the point of this fantasy is to underscore dramatically the reality that about 99 out of every 100 materials now being used by teachers and learners have never been verified and revised with even one, single learner. If this fantasy itself were to be translated into reality, publishers might legitimately ask how they can pick just one learner and know that he or she is the right one. To such a question, a reasonable response would be that since publishers cannot hope to find the one learner who is representative, they shouldn't try. They should simply find a reasonably articulate, not too overly bright member of the target population and pay very strict attention to what happens when he or she uses the materials or answers questions about them.

It would also be reasonable to point out that once this one learner verification and revision experiment had been completed publishers could, in time, empirically learn more about just how large (i.e., small) a learner verification and revision group might be optimum for various types of materials and learners.

The issues being aired in these pages have been building for some years

now and to date there has been more bombast than action on the part of the education industry. But now that both bombast and action by the industry have increased in response to mandates from legislators in two major adoption states, it remains to be seen what educators will do in response to such mandates. They can help make them into important first steps along the path that the education industry seems willing to move if the market demands it. Or, they can help reinforce the status quo by failing to view these mandates as means for correcting the present materials-quantity/instructional-quality imbalance.

Each company in every part of the industry will be watching closely every direct and indirect communication from educators on this matter. Perhaps it is too much to hope that the substance of such communication would be that both parties know that they've got to do better jobs of developing and using instructional materials and they agree to get on with it. If the industry, in particular, were willing to start operating from such a premise, the results could indeed be rewarding for all concerned. But especially for the 50,000,000 ultimate consumers of its products.

One of the things that the industry could do to help itself and these learners would be to start openly communicating about effective product improvement techniques. Of course it will be difficult to bring about such communication within an industry that is as highly competitive as the education industry has become, but for years the only real "communication" of new knowledge within that industry has occurred via professional job mobility from company to company. In this way, new techniques (such as they have been) have been transmitted more or less haphazardly. As a result, no open forum for the sharing and criticism of new techniques designed to advance the state of instructional

materials development and use has ever existed. Unfortunately, the journals of educational research do not perform that function. And in my experience they are not looked to by professionals in the education industry as relevant to their very practical research and development problems.

Where do the committed professionals in the instructional materials business turn to increase their own professional growth? Because education lacks a fully developed "hard science" of learning to guide instructional materials specialists, they must rely primarily on empiricism -- informed by what little hard science research in learning has thus far produced.

However, if the education industry does respond to this "imperative of empiricism" in an open manner, then some appropriate, useful means of communication will emerge to reinforce that openness and to record the empirical progress it will make possible. Perhaps an important first step toward bringing about such communication has already been taken by the present learner verification legislation in two states which requires that a producer document fully the learner verification activities engaged in for a particular product.

Despite the fact that the majority of the documentation made available by companies so far in response to the laws of these states has proven to be of the teacher-testimonial variety, a few of these documents have told a good deal about product development that could be useful to the profession, without revealing any proprietary information. One hopes to see more of this sort of documentation as time goes on. Some of what gets documented may sound quite scientific and may indeed actually approach being scientific, but we can and should expect much of it to be the reports of intelligent trial and error and what Dr. Susan Markle has called "successive approximations to an ideal standard"-- a

standard that may not be specified with precision for years, but may nevertheless be pursued with passion and confidence by careful, dedicated, empiricists.

To those who may tend to doubt the power of empiricism -- done on a small scale and based on careful observation of facts, attention to detail, and intelligent trial and error -- it may be well to remember that, at present, it's the best we've got. And that proceeding empirically in the absence of hard science in order to improve what we have as best we can is better than indulging in easy scientism that improves nothing -- least of all, honest productive communication.

Perhaps, in time, a fully developed "hard science" of learning will emerge upon which to build instructional materials that are far superior to any we can now imagine. Perhaps not. However, no significant breakthrough of this sort seems likely to occur in the near future. Thus, as the hoped-for movement toward empiricism outlined in these pages gains momentum, we may do well to remind ourselves of another period during which empiricism awaited the development of "hard science." This was a 90-year period in English history that culminated in design of the "improved" steam engine by James Watt in 1776.

Unless you are among those still under the misapprehension that James Watt invented rather than improved the steam engine (learned, very likely, from an elementary school textbook you used years ago), you are well aware of the fact that steam engines had been invented and used about a century before in both England and in Germany. These were rather inefficient devices compared to Watt's engine, but they did work successfully enough to pump water out of mine shafts, something of great importance to the mining industry of the time.

During the four generations between the invention of that engine and Watt's

improvement of it, many incremental empirical advances were made in the design of available engines. Watt knew of these, and he built upon them and informed them with what "hard scientific" knowledge he had available to him. He then designed an engine that was good enough to power the industrial revolution.

At present, the education industry is desperately in need of its own empirically improved designs for instructional materials. Whether such empirically improved designs will ever become sufficiently informed by "hard science" to power an "instructional revolution" remains to be seen. But in the meantime, those advising the education industry must avoid acting as though there is science where none yet exists. That is the express route to scientism -- a word which can be succinctly defined as "the use of the trappings of science to trap nonscientists into believing things their common sense would otherwise recognize as nonsense."

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